Creation/*Evolution*

Issue 33 **Winter 1993**

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About this issue . . .

CONFRONTING CREATIONISM might be a title for this issue. From time to time we publish manuscripts dealing with debates. More often than covering debates themselves we try to provide solid information of use to would-be debaters and anyone else interested. For this issue, though, we concentrate more than usual on the debate topic itself. An article by William Thwaites and Frank Awbrey reports their view of a debate with ICR speakers last spring which was heartily denounced in creationist publications. Critiques of previous debates and public talks follow—a long analysis of the tactics of Duane Gish written by Karl Fezer and a piece on the ICR's founder, Henry Morris, by Richard Trott which questions the creationist attack on evolutionary theory as the major cause of racism and asks questions about structures built upon sand. (As editor, I should note that Morris's supposedly Bible-based categories of three basic racial groups are unknown to anthropology, biology and genetics.)

Since C-E debating is controversial, I asked a number of people for short comments on their value—and received a lot of redundant denunciation of the process from evolutionists and creationists alike; both crowds agreed that the basic effect depended upon "show biz" skills more than superiority of argument. Former editor Fred Edwords wrote years ago that evolution should be defended in public debates by skilled debaters, not skilled scientists, and that having the debate focus on nonspecialists' skills rather than the efficacy of evolutionary theory was an especially valuable tactic.

Finally we have a previously-advertised second half of a review of Phillip Johnson's book *Darwin on Trial* (part I appeared in *C/E* 31). Johnson's book and its argument against "philosophic naturalism" has become a major creationist cause, succeeding the "equal time" argument, at least for a while.

Outside the combatative zone, we also publish an article to update readers on *Archaeopteryx* news—a favorite creationist topic.

John R. Cole

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The journal of evolution and science education which explores aspects of evolution and antievolutionism

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Cover: "Here's a portrait of the editor's great, great, great, great . . . grandfather. Isn't he nice? You see, he comes from a race distinguished even in antiquity for its sense of humor."— *Evolution*, December 1927, p. 16.

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Our Last Debate: Our Very Last

William Thwaites
Frank Awbrey

We are among a relatively small band of pioneers who first figured out how to debate the creationists more or less successfully. Our first debate was in 1977 with Duane Gish and Henry Morris. Our technique was simple: We spent several months in the library and looked up the reality of every creationist argument we could lay our hands on. When this was finished, we made 2x2 transparencies for each argument: usually one showing the creationist claim, one showing facts from the library, and a third giving the conclusion regarding the validity of the creationist claim.

Back in the early days, we thought there might be some small chance that a creationist would dig up a real biological paradox, one that would prove to be an interesting brain-teaser for the scientific community. We hoped that we could use the creationists to ferret out biological enigmas much as DEA agents use dogs to seek out contraband.

So, in our first debate we played by creationist rules and were models of professionalism and civility. We even went so far as to participate in their charade and not mention that their view was religiously defined. While we had discovered that every creationist claim so far could easily be disproved, we still had hope that there was a genuine quandary in there somewhere. We just hadn't found it yet. This hope, as small as it was, was enough to give a modicum of legitimacy to the creationist claim that they were "only doing science."

In the years that followed, we have tried to get as much mileage as possible out of our library encampment. We helped launch the *Creation/Evolution* periodical to serve as a handy reference for other debaters and high school teachers confronted with creationist claims. We even started a genuine "two-model" course here at SDSU where we invited creationist celebrities to the classroom and then discussed their ideas at the next meeting. After a

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while, we became the world's foremost experts on Southern California creationists.

But gradually and relentlessly, our disillusion with creationists grew closer and closer to 100%. The creationists who came to our class would pretend to be mainline scientists while they were with us. "Noah's Flood, you ask? I didn't come here to lead a Sunday school class. I'm here to talk about geology," one would say.

Often they would duck all questions relating to creationism by asserting, "That's a question about Biblical Creationism. I'm here to discuss Scientific Creationism." Sometimes students would even ask us if we thought a particular guest was really a creationist. Clearly, it was time to start using written and recorded creationist propaganda rather than live creationists.

In their books, tapes, and records creationists show their true colors. In these media they are talking to the public. In their public statements the flood was *Noah's* flood, the world is between 6 and 10 thousand years old, radiometric dating is either a pack of lies or a pseudoscience based on wishful thinking and faulty assumptions, and evolution is inspired by Satan and the root cause of all social ills.

We have done more debates since the disillusionment became complete, but the intervals between them have grown. This year was our last public debate and here's why: The debates are creationist affairs. In 1993 one of our biology students wanted to have a debate sponsored by the field biology club in our department. The department said that it would save its meager resources for real issues in biology rather than religious issues. We concur.

Then sponsorship fell to "Student Life," the on-campus branch of the College Avenue Baptist Church. Student Life did a truly fine job of organizing the debate. They thought of just about everything. One of us (Thwaites) wishes he had had help like that when the AAAS Pacific Division meetings were held here a few years ago!

But the debate was obviously a Baptist event from the word go. When their planning was finished, they gave us an outline that included maps, time-table, goals, etc. The debate would start at 6 pm, and there would be a prayer (for us?) at 4 pm. The outline even listed what would make the debate a "success." One criterion for success was the listing: "Unbiased/non-religious."

We were being asked to participate in their charade again. Creationism *is* religious and biased. After nearly 15 years of studying creationist claims, we'd say that we are biased, too. How could we help but be biased? If we tried to make creationism look like science, we would be guilty of gross prevarication. A phone call to the College Avenue Baptists was in order.

"Oh no! We didn't mean it that way. We just wanted our people to refrain from waving their Bibles, and things like that, you know. You scientists are free to discuss whatever you think you have to." Well, she was so nice over the phone. There went a good excuse to back out, but we still had the feeling

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that our own Montezuma Hall was going to be College Avenue Baptist property the night of the debate.

The CABC outline also stated that the debate would not be a contest of "wit or rhetoric," but that it would be a "profitable exchange of ideas for the students." They had never checked with us on this item, either, but it wasn't worth a call to the nice young lady. We simply gave our SDSU public relations department a statement that said that we were "looking forward to the wit and rhetoric engendered by these events."

Then there was the matter of tables in the lobby. That too was covered in the CABC outline: one for ICR, two for refreshments (to be sold by CABC, we think), one for a "booth" for unspecified purposes, and a "question and answer" table for sorting written questions. Another call to the church was called for. "Oh! Someone mentioned that you guys might want a table. You've got it! Will one be enough?" the nice young lady said. And there went another reason to back out. But now, more than before, we felt like outsiders even in our own student center.

Suddenly April 29 was at hand. Just before the debate, a team of young men were setting up a video projector in front of the carousel projector. "Who's going to be using videos in the debate?" we asked. It turned out, the organizers had a 5 minute video to "set the tone" for the debate. They certainly hadn't told us about this. It didn't reflect our view that creationism is silly nonsense—a "tone" we might have noted. No, it said that creationism or evolution is the big decision of *your* life. It implied that the future of the universe depends on your ability to make the *right choice*. Had we been told that there would be a video shown before the debate, we could have made one that compared the flat-earth debates of 19th century England with 20th century debates on creationism in the US.

As expected, the audience was composed mostly of creationists. The organizers spared us the trouble of signing attendance cards which were there for some Sunday school class that was required to listen. They would sign the cards. That was nice.

In the debate, when ICR's Duane Gish or Richard Lumsden would tell a joke, Montezuma Hall would shake with laughter. When we would come up with a clever line, a little knot of fellow faculty and graduate students would laugh uproariously, while 95% of the audience would sit looking perplexed.

The creationists could tear into the stupidity of evolutionists for swallowing the Piltdown hoax, but we were engaging in *ad hominem* attacks if we pointed out some humorous claim made by an identified creationist. That's a major problem with the debate format. Swallowing the Piltdown hoax is kind of a system-wide thing that all "evolutionists" supposedly did. On the other hand, creationism is such a cottage industry that there is a tremendous amount of variability in it—enough to explain away any lapses. Thus, for example, when Awbrey told the audience that faunal succession falsifies the

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most basic of creationist tenets, Gish was able to say that there are progressive creationists who accept faunal succession just as we do.

So, in order to make a criticism stick, an evolutionist must go after specific claims made by specific creationists. And if you happen to think the claim is really funny, that's a vicious *ad hominem* attack according to almost everyone in the audience.

On the plus side, though, there aren't many other opportunities to talk to so many biblical literalists all at one time. Nevertheless, we both felt a little used by the creationists. Debates are their game. They make up the rules. And for the audience, it is mostly creationists who are sufficiently motivated to sit on hard chairs for four and a half hours listening to such silliness.

So, when all was said and done, did we really gain anything? The answer has to be "yes." We gained because we found out that this was going to be our last public debate with creationists. And we might possibly have gained a mind here and there before it was filled with creationist claptrap. Some neutral students sometimes show up.

If you ever think you want to debate creationists on their terms, demand a hefty honorarium and donate the proceeds to NCSE. Then there is sure to be a gain. [*An unsolicited noncommercial announcement!—Ed.*] C/E

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Creation's Incredible Witness: Duane T. Gish, Ph.D.

Karl D. Fezer

Duane T. Gish, Ph.D., is vice-president of the Institute for Creation Research, which bills him as "the world's leading creationist debater." Much of his time is spent on the creationist lecture circuit, where he draws large crowds. The crowds are even larger when a "debate" is arranged with a member of the scientific or professorial establishment.

By now Gish has participated in several hundred such "debates." They are often initiated when a member of the local clergy, or a student, invites a local professor or scientist to take part. Whether such participation is advisable depends on various factors. This article documents one important reason for refusing to participate: For an audience to be enlightened by a debate, both debaters should be truthful. Gish disqualifies himself by his indifference to truth and by his skill in giving fiction the appearance of truth. A large book could be written documenting this accusation. I here describe just two examples, in the hope that they will suffice to help persons seeking debate engagements for Gish to understand why their requests are being refused.

I was approached by Pastor Dennis Barnhart of Spring Hill Baptist Church in South Charleston, West Virginia. He had been chief local organizer of ICR's Back-to-Genesis Seminar in Charleston. Since my article highly critical of ICR had been published in *The Charleston Gazette* nine days before that event (see Fezer 1993), I felt an obligation to be willing to defend my accusations in public. So I agreed to debate Gish, provided the debate format would allow me to hold him accountable for things that he and others at ICR had said and written. Pastor Barnhart agreed that this was a reasonable condition, and all negotiations proceeded with him as intermediary. Essentials of the negotiations are in writing.

Dr. Fezer is professor of biology at Concord College in Athens, West Virginia, a former editor of *NCSE Newsletter* and a contributing editor to *NCSE Reports*.

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Gish, as usual, wanted long speeches by each debater; I wanted short and specific challenges followed by the same kind of responses. We compromised as follows: Each debater would have two 20-minute turns. After the first intermission I would have time for at least four specific challenges up to five minutes in length, and Gish would have up to five minutes to respond to each. Then another forty minutes would be devoted to him challenging me and to my responses. A question and answer period and closing remarks would follow a second intermission. The entire program was to last nearly four hours. (An audiotape of the entire debate, held at Concord College on March 24, 1992, is available on loan from NCSE.)

Gish was told that each member of the audience would be handed a copy of my *Gazette* article and, attached to it, a copy of NCSE's flier [*Creation or Evolution?*], George Bakken's rebuttal of major creationist claims. I expressed the hope that Gish would respond to some of the challenges in my article, and he was invited likewise to hand out free literature. He did bring a number of *ICR Acts & Facts* and *ICR Impact* articles for free distribution.

I report here only on my first two challenges and Gish's responses to them.

First Challenge: On Whales

I said that both modern and fossil whales provide marvelous evidence that they had four-legged, land-dwelling ancestors. I showed a picture of fossil whale skulls, from 45 to 15 million years old, showing the nostrils in various positions of retreat to their present position on the top of the head (Linehan 1979:517). I showed a picture of a baleen whale that, as an adult, has baleen ("whale-bone," used for filter feeding) suspended from the palate but, as a fetus, has tooth buds in their usual location that are reabsorbed before birth. Why?, I asked. It also has fur which is reabsorbed before birth. Why? Likewise hind leg buds. It has hip bones but no hips. Occasionally a whale has rudimentary hind limbs. I showed a drawing of the dissection of a sperm whale showing pelvic bone, rudimentary femur and tibia, together with muscles, nerves, and blood vessels serving these structures, with the limb tip protruding just slightly from the side of the animal (Ogawa and Kamiya 1957). I cited one study of minke whales in which 13 out of 50 males had rudimentary femurs, but the remainder did not (Omura 1978). I asked, if every structure in organisms is designed by God to serve some function, as Gish claims, how is the function of those femurs being served in the 3/4 of minke whales that lack them?

Then I showed a drawing of the skeleton of the early whale, *Basilosaurus*, complete with tiny hind legs, as reported by Gingerich *et al.* in July 1990. In August 1990, at the International Conference on Creationism in Pittsburgh, Gish told his audience that *Basilosaurus* was probably a reptile (Schadewald 1990). [In this challenge I said, incorrectly, that Gish called *Basilosaurus* a mosasaur. Mosasaurs were Cretaceous serpentine marine reptiles with a

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superficial resemblance to *Basilosaurus*. Before his lecture in Pittsburgh, Gish had seen one in the Carnegie Museum of Natural History there. Those of us who heard him, and had also been to the Museum, surmised that this might have been the basis for his calling *Basilosaurus* a reptile. (Schadewald 1990.)] In my challenge, I said that Gish, in his 1985 book, devotes half a page to listing differences between mammals and reptiles (1985:96-97). An expert on fossils [which is how ICR describes Gish] not being able to tell the difference between mammals and reptiles, I said, is like a good mechanic not knowing the difference between a gasoline and a diesel engine. I pointed out to the audience that my article in *The Charleston Gazette*, handed out before the debate, accused Gish of calling *Basilosaurus* a reptile. After publication of this article, in ICR's subsequent program in Charleston, Gish defended his claim by saying that *Basilosaurus* was originally described as a reptile and that its name means "king lizard." I showed two sentences from the 1990 article by Gingerich *et al*. The first of these evidently was Gish's source of this information. But, I said, he ignored the very next sentence: "Richard Owen demonstrated the mammalian characteristics of *Basilosaurus* and, within mammals, its cetacean affinities (9)." The reference is to an 1839 paper by Owen, the most famous anatomist of his time. So I challenged Gish to tell us once again whether *Basilosaurus* was a reptile or a mammal. Here is his response, word-for-word, but with analysis by me inserted after each component of his response. (The inserted analysis was not part of the debate.)

> Can you hear me? Can you hear me? Ladies and gentlemen. First of all let me say I'm terribly disappointed. I don't know what happened here tonight. I've heard, and of course we've all heard, Dr. Fezer very, very well. I understand my microphone was weak and some of you had difficulty hearing. I don't understand that at all. I'm very sorry to hear that. Were you up in the balcony able to hear my presentation? Were all of you able to hear it? [Audience answers affirmatively.] Well, I'm very happy to hear that because somebody came up here and told me it was very, very difficult to hear. Well, I'm glad Dr. Fezer finally got around to his challenge after his lecture.

The debate tape reveals a lowered audio volume for about one and a half minutes during Gish's second 20-minute talk. The audio technicians told me afterwards that our voices were so loud they had a hard time controlling feedback. [*Ed: Personal experience indicates that neither Gish nor Fezer need worry about being heard by an audience in the same county!*]

> Let me say this, I did not say that *Basilosaurus* was a mosasaur. I said that it was a reptile, very likely a reptile. Now, the name *Basilosaurus* means "king lizard." It was classified originally as a reptile. Richard

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> Owen came along later and said that he thought it had some mammalian affinities. That's what he said in a paper published in 1838 [*sic*].

Note that Gingerich *et al.* (1990), in the sentence I quoted above, say that Owen "demonstrated" the mammalian characteristics of *Basilosaurus* and, within mammals, its affinities to whales. There is no hint of uncertainty or doubt in their wording, contrary to what Gish implied by his choice of words.

> Now, in this paper that he referred to, which—I have a copy with me, these scientists—, the only documentation that this creature is related to whales or is a mammal was a reference to the paper by 1838. The distinguishing features between a mammal and a reptile of this kind is going to be found in the skull. Now, if that was a mammal it would have three bones in the ear and a single bone in the jaw and have a mammalian type jaw joint and other characteristics of a mammal. They did not even mention this skull.

The 1990 paper by Gingerich *et al.* that Gish held in his hand during his response is "Hind Limbs of Eocene *Basilosaurus*: Evidence of Feet in Whales." It is about the newly discovered hind limbs of *Basilosaurus*, not about other, previously described features of this creature. The authors' sentence citing Richard Owen clearly implies that Owen's analysis was definitive and is accepted by the scientific community today. The reference to whales in the title of their paper has the same implication. Schadewald (1990) says that, according to vertebrate paleontologist Robert E. Sloan, "*Basilosaurus* has no reptilian characteristics beyond its serpentine shape. Its skull, teeth, mandible, vertebra, sternum, and limbs are all thoroughly mammalian."

Gish implied that Gingerich *et al.* should have repeated all the previously reported evidence for *Basilosaurus* being a mammal and a whale, even though the authors cited a reference where this evidence is available. Yet Gish knows that space in scientific journals is expensive, and that authors are expected to cite where previously reported information can be found rather than repeat it.

By reciting some characteristics of mammalian skulls Gish simultaneously conveyed two false impressions: (1) that he is knowledgeable about *Basilosaurus* and (2) that the evidence he was demanding does not exist.

> Now, I said I believe that thing was a reptile and let me say why I believe it. Its fossils are found with animals that lived on the land, with terrestrial animals, with terrestrial fossils. It's not found with fossils of marine animals. If it lived in the sea, if it was a whale, as Dr. Fezer claims, why wasn't it found with fossils of marine organisms? Why was it found with fossils of animals that lived on the land?

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Gingerich *et al.* (1990) say *nothing* about fossils of other organisms associated with those of *Basilosaurus* (not their subject), but they clearly state that the *Basilosaurus* fossils were obtained from *marine* sandstones and shales. Gish's assertions here seem to be derived from a different paper (Gingerich *et al.* 1983) about different, earlier fossils in a different part of the world. In that paper *Pakicetus* is described as "an amphibious stage in the gradual evolutionary transition of primitive whales from land to sea."

This shows, also, what should be obvious—that association of a fossil with fossils of terrestrial organisms is no reason to conclude that the organism was a reptile. After all, most mammals are terrestrial. Even if there had been evidence that *Basilosaurus* was terrestrial, it would have helped not one bit in establishing it as a reptile. Such an odd blind alley may impress audiences, but it leads nowhere.

> Now, furthermore, according to this article, this creature had powerful leg muscles. It says here that it had powerful muscles on its legs, and the knee has a complex locking mechanism. Why would a whale have strong powerful muscles in its legs—the hind legs—and have a very complex locking mechanism if it lived in the sea?

Gish here returned to citing the 1990 paper by Gingerich *et al.* about *Basilosaurus*. His rhetorical question implied that this information is incompatible with a marine existence. In fact, the paper actually says that the hind limbs "appear to have been too small relative to body size to have assisted in swimming, and they could not possibly have supported the body on land." Further analysis leads its authors to conclude, "Abduction of the femur and plantar flexion of the foot, with the knee locked in extension, probably enabled hind limbs to be used as guides during copulation, which may otherwise have been difficult in a serpentine aquatic mammal." Gish brazenly ripped phrases from their context and attached to them a meaning *opposite* of that implied by the evidence and stated by the authors he claimed to cite.

> Now, furthermore, these people said this creature did not have—by studying the skull, they said they could discover that it could not hear directionally under water. A whale must hear directionally under water. This animal could not. They said, furthermore, it could not dive because it did not have the proper structure in the ear. You know that some whales, the sperm whale for example, dives at 7 and 8 thousand feet down in the water with tremendous pressure and stay down there as long as two hours before it must come up and breathe. It has a very special structure of the ear to allow them to withstand that tremendous pressure. This animal did not—it did not have that—could not hear directionally under water.

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Gish told us previously (and correctly) that the 1990 paper by Gingerich *et al.* does not even mention the skull. (An endnote does refer to the skull of Late Early Eocene *Pakicetus* and contrasts it with the "more specialized crania" of Middle and Late Eocene whales.) Now Gish claimed the authors had much to say about the skull of *Basilosaurus*. But there is nothing in that paper resembling anything in Gish's remarks just quoted. Once again his remarks seem to have been based, in part, on the 1983 paper about *Pakicetus*. And isn't the *lack* of deep-diving equipment exactly what one would expect in an animal representing an early stage in the evolution of a marine animal from a terrestrial ancestor?

> And furthermore, the pelvic bone in whales, even as this article states, is functional. The pelvic bone in whales—the muscles involved in reproduction and in other functions—are fastened, anchored to that pelvic bone. It is not vestigial. It is functional. Now, finally, the claim that this thing had some vestigial structures—I have an article published in the *Evolutionary Theory* in May of 1981—the questions these evolutionists asked—do "vestigial organs" provide evidence for evolution? He said they do not. First of all, they have—practically every one has been shown to have a function—they are not vestigial, they have a function. And even of the very few which we have not yet discovered a function, that just describes our ignorance. We just don't know what function they have. This thing did not have vestigial structures, fully functional, and I believe the evidence does show that it was a reptile and certainly was not a whale.

Gingerich *et al.* (1990) point out, "The pelvis of modern whales serves to anchor reproductive organs." So, yes, whale pelvic bones have a function. Nevertheless, they constitute evidence for evolution because their shape suggests tetrapod ancestry, even though they lack most of the functions that pelvic bones, shaped as they are, serve in tetrapods. By the same kind of reasoning, reabsorbed tooth buds, hind limb buds, and fur in fetal baleen whales will remain as evidence of ancestral characteristics, even if they should be found to serve some function in the development of these animals.

The reference cited by Gish argues that one cannot logically prove that a structure has no function (Scadding 1981:175-176). But facts that tend to support a conclusion count as evidence, even if alternative interpretations are possible. When most members of a species lack a structure that a substantial minority possess, it is reasonable to conclude that that structure does not serve an essential function. That is why, in my challenge, I mentioned the finding of Omura that three fourths of minke whales lacked rudimentary *femurs*, while one fourth had them. If these serve some essential function, how is that function met in the whales that lack them? Gish ignored this question and

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merely repeated the standard creationist claim that all "vestigial" structures must have some function.

This claim, as the paper cited by Gish points out, is based on the theological doctrine that God creates nothing in vain. The author concludes that "the vestigial organ argument is essentially a theological rather than a scientific argument" (Scadding 1981:174).

To sum up: Gish knew this challenge might come and had prepared his response. He even held the relevant paper in his hand during his response. His response provides clear evidence that he had studied it. He then proceeded to mix up evidence from two papers about two different organisms. He extracted information from both papers, in each case glaringly out of context.

Apart from the original mis-identification of *Basilosaurus* as a reptile, cited in the paper Gish was holding, Gish did not introduce a single fact that supported his claim. He presented no evidence from that original report that might have supported his claim. He did nothing to show that Owen and later scientists erred in concluding that *Basilosaurus* was a mammal and an early whale. He did not even claim to have studied the literature cited in the 1990 paper by Gingerich *et al.* And he did not claim that he himself had studied, or even that he had ever seen, any fossils of *Basilosaurus*. Nor is there any evidence that Gish would have been qualified to evaluate them if he had seen them.

But in spite of his gargantuan ignorance on the subject, Gish, driven perhaps by his role as ICR's "expert" on fossils, continues to announce to the world that the real experts are wrong. Apart from the preliminary identification, subsequently corrected by Owen, Gish did not present a single shred of evidence that *Basilosaurus* was a reptile. Nor did he present any evidence that it was not a mammal and an early whale. Yet his last sentence emphatically asserted that he did. This is the technique of the Big Lie.

Second Challenge: On Hominid Fossils

I began my second challenge by saying that nowhere does ICR have a greater phobia about recognizing intermediates than with regard to the human lineage. For example, to discredit the fossil called "Lucy," Morris and Parker (1987:160) say, "fossils of ordinary people in mid-Tertiary rock were found in Castenodolo, Italy," so if ordinary humans are older than Lucy, then of course Lucy couldn't be an ancestor. What they don't tell the reader is that those fossils have been tested by a variety of methods, shown to be young specimens (maybe 10,000 years old) buried not in a mid-Tertiary deposit but in Pliocene deposits (Conrad 1982:15-16), just as you or I presumably will be buried in dirt older than we are. Further up the same page, Morris and Parker go through a litany, the same sort that Gish presented earlier in this debate, that implies that there are just a few proposed human ancestors and

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that none of them constitute good evidence: "All the candidates once proposed as our evolutionary ancestors have been knocked off the list." Neandertals, just people; Piltdown, hoax; Nebraska Man, pig's tooth; Java Man, Peking Man, bad science, etc.

But, I said, Dr. Eric Meikle at the Institute for Human Origins told me last week [mid-March 1992] that he was compiling citations to all specimens of hominids up to the Holocene period [which began 12-14,000 years ago], and so far he has 1400 such specimens in his list, 64 of which are *Homo erectus*. I showed my audience a just-published chart of all the places in four continents where well-dated hominid fossils have been found (Thorne and Wolpoff 1992:82).

As to the claim that Java Man and Peking Man are based on "bad science," I noted that Gish (1985) devotes 17 pages to discrediting the people who found and described Java Man and Peking Man. For example, Gish says that Dubois, the discoverer of *Pithecanthropus* (Java Man), also found two fully human skulls at the same level at "nearby" [Gish's term] Wadjak. Gish says Dubois didn't reveal the existence of these human skulls until 1922—30 years later—because it would have discredited his claims that Java Man is an intermediate. "His failure to reveal this find to the scientific world at the same time he exhibited the *Pithecanthropus* specimen was deplorable since this constituted concealment of important evidence" (Gish 1985:181). Six years earlier, in *Evolution: The Fossils Say No!*, Gish (1979:125) had made the same claim, ending by asserting "[Dubois's] failure to reveal this find to the scientific world at the same time he exhibited the *Pithecanthropus* bones can only be labeled as an act of dishonesty." Morris and Parker (1987:154) make the same claim and cite Gish as their reference: Dubois, they say, "found—but kept secret for thirty years—a human skull discovered at the same level." Other authors have repeated the charge. Gish, in his widely distributed comic book, *Have You Been Brainwashed?* (n.d.:17), says, "Dr. Dubois . . . concealed for 30 years the fact that he found human skulls near his Java Man, and at the same level. So man was already there when this creature was alive."

I then read an excerpt of the text of anthropologist Dr. Loring Brace's remarks when he debated Gish at the University of Michigan in 1982:

> To put the matter straight, "nearby Wadjak" is a good 100 miles of mountainous countryside away from Trinil, the site of Dubois' *Pithecanthropus*. Nor is it accurate to call them "approximately at the same level" when one is well over half a million years old and the other is less than 10,000. Finally, Dubois did publish preliminary accounts of his Wadjak material in 1889 and 1890, before his Trinil discoveries were even made, and he recapitulated these in print in 1892 before becoming involved in what he correctly realized was the far more significant "Pithecanthropus" issue.

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I got the signal that my five minutes were up after the word "correctly" in the last sentence, so I stopped there, said I would save my "punch line" for the next challenge (and failed to summarize my challenge to Gish). Gish's response consisted mostly of assertions that he has made repeatedly in his books. He began thus:

> I still, you know—Dr. Fezer asked for this format, and it's supposed to be a challenge, but he gives a lecture and he doesn't give the challenge. Now, I'd like to have a challenge. The challenge apparently, I think, what he wants me to do is to explain about this Wadjak skull. I have read data which shows that Loring Brace is *not* correct in what he says; that is not correct. *That Eugene Dubois did not come out and say that at all.* As a matter of fact, Sir Arthur Keith said this—Sir Arthur Keith excused—gave the excuse—for Eugene Dubois, why he did not reveal that Wadjak skull. Sir Arthur Keith, a British evolutionist, said this: It would just be too big a meal for people to swallow. And he said that he found that Wadjak skull and the so-called Java Man in relatively the same level. And it was the same level; I don't care if it's a hundred miles apart. I don't care it it's a thousand miles apart. It's found at the same level and he did *not* reveal that until 30 years later when someone published a paper on Wadjak, and so he thought he better rush into print then, because he would lose any credit for his discovery of Wadjak skull. I did not accuse these scientists of being dishonest. I said that this one person, that Dr. Dubois, was guilty of—you could call it dishonesty or something—he did not reveal that he found that Wadjak skull—those Wadjak skulls—when he found his *Homo erectus*, so-called. That is not being honest, and that's what Sir Arthur Keith said—why didn't he do this, why didn't he reveal this? It would be too big a meal for the anthropologists to swallow. And so he concealed one, you see, until he got the other accepted. Now we don't want to accuse anybody really. Let's don't argue about who's honest or dishonest. Let's deal with the facts, let's see what are the facts.

I sent a transcript of these and other remarks by Gish in the debate to Dr. Loring Brace, who responded (1992, Pers. Comm.):

> Gish is right on one point: Keith did say what Gish attributed to him, but then Keith never made any effort to go back into the record and read what Dubois wrote at the time of the discovery of Wadjak. [Dubois's early reports on Wadjak are cited and described below—KDF.] [Gish] is completely wrong on his repeated assertion that the Wadjak and the Trinil skulls came from the "same level." Neither Dubois nor anyone else ever said that, and it would be a meaningless statement in any case. The Wadjak finds were made in cave deposits

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in the mountains near the south coast of Java while the Trinil finds were made in river deposits on the flood plain that occupies the northern part of the Island. Dubois may have thought that Wadjak was early in the Pleistocene, but he was aware that Trinil was much earlier. In fact, he felt that it was Pliocene. He knew that Trinil was associated with a fauna that was characterized by archaic and now extinct animals. The Wadjak "levels," however, had animals that are now extinct in Java—such as the orang—but that continue to live elsewhere. Dubois was much too good a field geologist to compare the "levels" of mountain caves with riverine flood plains, so he never said anything about "levels." He was well aware, however, that the fauna associated with those two sites came from very different *time* levels.

Note also that Gish denied and then admitted that he called Dubois dishonest. It takes serious chutzpah to call someone else dishonest, to lard one's own remarks with fiction, and then to suggest that we not call anyone dishonest and that we should deal only with "the facts."

Gish continued his response to my challenge:

> And Marcellin Boule, a great French expert on human fossils, who was an evolutionist, he went over there to study Java man and Peking man. And he said he did not believe that those Peking man creatures were humans or related to humans. He asked a question: Who was it that killed and ate those Peking man creatures. Their skulls had been bashed in so the brains could be taken out and eaten. Only the skull, teeth and jaws were found. The post-cranial skeletons were not discovered there. So they did not die where they were found. They had been killed somewhere else, eaten and carried to the site where they were found. He asked this question of this evolutionist: Who was the hunter, who killed and ate those creatures? He said he did not believe—what he said was this—that he believed the evidence indicated a true man, *Homo sapiens*, was the one who killed and ate those creatures. You can't have man eating his own ancestors, that's for sure. And it was this great French expert, Marcellin Boule. Was he correct? Then those certainly were not our ancestors.

First, says Brace, Marcellin Boule never went "over there to study Java man and Peking man." Gish (1979:133) wrote that "Boule had visited Peking and Choukoutien and had examined the originals." In his debate with Gish *a decade ago*, Brace (1982) called this "pure invention" and said, "Boule did not visit Peking, he did not visit Choukoutien, and he never saw the original specimens. Instead, as he made quite clear in print, he relied entirely on the photographs and information furnished to him. . . . " Brace (1992) elaborates, "Dubois did bring the Trinil specimen to Paris, and Davidson Black sent

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Boule the photographs that Boule later used in his discussion." Gish (1985:192), three years after having been corrected by Brace, repeated his earlier claim *word for word*. Brace's remarks in his own debate with Gish, only slightly edited, were published in *Creation/Evolution* (1986), a journal that every creationist interested in getting his "facts" right should read. Yet Gish is still making the same incorrect claim in 1992, as if it had never been challenged and corrected.

Brace (1992) says, furthermore, that Boule "certainly was *not*" an evolutionist. Elsewhere Brace (1964:19) explains, "The theoretical bases of Boule's thinking stem from the early nineteenth century position of Georges Cuvier who attempted to explain the sequence in the fossil record by a series of catastrophes with their attendant extinctions and subsequent invasions." Brace (1964:33) elaborates,

> Boule was an avowed champion of the study of human evolution, and his work has been accepted in many quarters as a contribution to evolutionary studies, but it should be pointed out that the term evolution did not have the same connotation in French paleontology that it does to the modern synthetic theory of evolution. Albert Gaudry, Boule's teacher and immediate predecessor [cit. to Boule 1904] was largely responsible for introducing the concept of evolution into French paleontology [cit. to Boule 1908], but he made a sharp distinction between "evolution" and "darwinism" [cits. to Gaudry 1878 and to Topinard 1888]. His concept of evolution left intact the theory of successive formations or creations. Darwinism, on the other had, involved the theory of transformation by means of natural selection which he refused to accept [cit. to Gaudry 1878]. Such was the "evolutionary" theory behind the interpretation of the French Neanderthals by Boule.

Brace (1992) continues:

> Boule's efforts to suggest that the Zhoukoudian [Choukoutien] specimens [that is, "Peking man"] represented the efforts of "modern" humans to dine at the expense of their supposedly primitive cousins was a deliberate attempt to remove the possibility that [these specimens] could serve as modern ancestors—just the way Gish is doing.
>
> Furthermore, it is simply untrue to say that the Zhoukoudian material lacked evidence from the postcranial skeleton. There may have been fewer representatives of the post cranial skeleton, and none of the long bones were complete, but there was enough so that Weidenreich was able to publish a 150-page monograph entitled "The extremity bones of *Sinanthropus pekinensis*" in *Palaeontologia Sinica* (new series D,

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No. 5). The legend that the skulls had been broken into to extract the brains arose because the cranial base was missing from so many of them, but it has been pointed out that this relatively fragile part of the skull often breaks off naturally after long interment and need not indicate deliberate intent on the part of anyone or anything. The most recent treatment of that issue is by [Binford and Ho (1985), who] conclude that Zhoukoudian was not evidence for cannibalism. They suggest the activities of hyenas to account for the relative lack of long bones and the fact that none were preserved whole. The material in the deposits represents the activities of scavengers. For myself, I am perfectly happy with this interpretation. Certainly there is no shred of evidence for another hominid there, whether of more modern appearance or not.

Gish concluded his response to my second challenge as follows:

Furthermore, down in East Africa, a Louis Leakey, in Bed 2, found the remains of these *Homo erectus* creatures contemporary with *Australopithecus*. Underneath, he found the remains of a circular stone habitation—a product of humans that is still made in Africa today. My questions are these: If *Australopithecus* and *Homo erectus* are found contemporary, how could one be the ancestor of the other? And if underneath, in an earlier strata, you find the products of humans, how could either be the ancestor of humans? Those are questions that evolutionists have never answered.

Here is Brace's (1992) response to these claims:

As for Bed 2 of Olduvai Gorge, the *erectus* is Olduvai hominid 9, a strapping male specimen, and there is evidence for the survival of a robust Australopithecine given by the presence of two molars and a canine tooth (Olduvai Hominids 15 and 16) also in Bed II. It is clear that robust Australopithecines did survive to be contemporaries of early *Homo* up towards the end of the Lower Pleistocene, but then the robust Australopithecines were not the ancestors of *Homo* in any case.

The famous "stone circle" is at DK I in Bed I, and it is definitely earlier, in fact, right down at the bottom of the gorge. The claim that it had anything to do with human habitation, however, has been quietly dropped. I got a look at it myself when I was there in the summer of 1968, and it is only a fancied interpretation of a whole slew of rocks spread over a large area. The part called the "stone circle" could most easily be produced by an eddy in the torrent that had distributed the rest of the rocks over yards of the stream bed at the bottom of the gorge.

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> Supposed circles of stones that held down the bottom of tents have been claimed for the late Upper Paleolithic in Northern Europe, but they are highly controversial, and many archaeologists are not convinced. For a circular arrangement produced by hominid activity to have survived for two million years in an area where everything was regularly redistributed by water activity and other natural causes is simply too much to ask us to believe. Even if one is inclined to accept it—which I certainly am not—there is no possible way to tell if the makers were modern or not. My undergraduate degree was in geology, and those arrangements of stones looked to me just like many naturally produced distributions that I have seen elsewhere. Only the strain of wishful thinking could have read human intent into it.

Then it was time for my third challenge. However, first I had to complete the "punch line" (I should have called it the "bombshell") of my second challenge: I showed a transparency saying, "The Wadjak skulls reported:" followed by citations to three reports by Dubois, dated 1889, 1890, and 1892, concluding with, "Gish says Dubois didn't reveal the Wadjak skulls until 1922." Then, to sum up, I showed a transparency with the following statements, and commented that they pertained, not only to Gish's treatment of Dubois, but also to his treatment of a number of other scientists who described Peking man.

- In 1979 book—Gish makes false, derogatory statements.
- In 1982 debate—Brace points out these errors to Gish.
- In 1985 book—Gish makes same false, derogatory statements.

I then continued with a third challenge, not reported here, which revealed the miserable scholarship behind Henry Morris's favorite argument for a young earth: the declining magnetic field argument developed by Thomas G. Barnes. I concluded with, "Dr. Gish, if your people can produce this kind of scholarship, how do you expect to get the scientific respect that you so urgently want?" Gish responded,

> Dr. Fezer, you set the format for this. We're following the format you suggested. Now, I suggest you hold to that format. You're given five minutes to give me a challenge, and I answer the challenge. Now, you're not supposed to take your next time, your next challenge, to go back to the old data in the previous challenge. You're violating your rules and regulations. Now, I'll just say this—those quotes you put up there, those so-called—in Dutch and everything else—I have had a refutation of the notion that Dubois revealed that. He did *not* reveal it in those publications, and it was just a false claim. Now, if you have five minutes to give me challenge, you stick

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> to that five minutes, but don't take your period to go back to these previouschallenges.

Calling Barnes a "brilliant physicist," Gish then went on to deal with my challenge regarding ICR's selection of Barnes as the first dean of its Graduate School.

Contrary to Gish's assertion, I did not violate my own rules. In a December 9, 1991 letter to Pastor Barnhart, I said, "The first minute of the challenger's next challenge may be devoted to comment about the responder's previous response." Through all negotiations before the debate Gish never challenged that. Since Gish here, for the third time in three responses, began by attacking me on a matter irrelevant to the substance of my challenge, it now seems reasonable to claim that this was a deliberate diversionary tactic.

Gish's indignation that Dubois had the gall to publish his findings in the Dutch language makes it seem most unlikely that Gish ever read those three reports. But that did not prevent him from denying that Dubois reported his Wadjak skulls in them. Brace (1992) provides translations of passages reporting on the Wadjak skulls from Dubois's 1890 report (1890a), as well as from another article written by him in 1890 (1890b). Regarding Dubois's 1892 report, Brace says:

> On page 60, [Dubois] notes his own work in the caves of the limestone mountains in the Wadjak District, and he mentioned the discovery of "a fossil human skull . . . of a race encountered in contemporary Australia (or Papua)." He went on to note that "there in September 1890 they found a second human skull" page 61 "with the same racial characteristics as the one found previously."

It is true that Dubois did not publish a detailed analysis of his Wadjak materials until 1922, and they are still the subject of continuing research and reinterpretation (Storm and Nelson 1992). But Dubois immediately reported their existence, together with a preliminary interpretation of them. Gish's charge that he kept them secret for 30 years is false.

Conclusion

Gish's responses to my first two challenges clearly demonstrate that Gish will say, with rhetorical flourish and dramatic emphasis, whatever he thinks will serve to maintain, in the minds of his uncritical followers, his image as a knowledgeable "creation scientist." An essential component is to lard his remarks with technical detail; whether that detail is accurate or relevant or based on unambiguous evidence is of no concern. When confronted with evidence of his own error, he resorts to diversionary tactics and outright denial.

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What is true of his speech is also true of his books. In 1982 Brace pointed out to Gish many errors and misrepresentations in his writings. An author concerned about getting his facts right would certainly, when accused of error by a recognized authority, seek out the relevant evidence. Yet Gish never asked Brace to cite his sources, and Gish's 1985 book contains most of the same errors and misrepresentations that he had published in 1979. Even though, in 1986, Brace published the text of his debate remarks, with citations to his sources, Gish continues to promulgate the same errors. Other scientists have also tried to straighten out Gish. There is little evidence that Gish modifies what he says to take this criticism into account. Appearance is everything. Truth seems not a high priority.

I conclude that a debate format that includes alternating five-minute time intervals still separates challenge and response too much to keep Gish honest. What is needed is a format in which (1) Gish faces a panel of experts, one for each field in which Gish dabbles. Like Brace, these experts need to be thoroughly familiar, not only with their own field, but also with what Gish has said about it. (2) The panelists strike a large gong every time that Gish gives false testimony, which signals their turn to interrupt and correct him. In this report I quote about eleven minutes of Gish's remarks. By sometimes allowing errors to accumulate before correcting him, I needed to interrupt the transcript of his remarks only eleven times.

Henry M. Morris, founder of ICR and still president, described its program in 1972:

> Our ultimate effectiveness will depend upon scientific and educational acceptance. . . . We believe the I.C.R. program of creationist research, writing, and teaching by qualified scientists offers the only feasible method of restoring creationism to a respected position in our educational and social systems.

ICR has made no progress toward this goal. Scientists with credentials forfeit their credibility by dishonest behavior. Morris himself set ICR's low standard. (Fezer 1985 provides a point by point analysis of one of Morris's writings.) Little wonder, then, that ICR's vice-president suffers from the same problem.

Epilogue

A song in Gilbert and Sullivan's *Patience* tells how to be an "aesthetic sham." The first verse, appropriately modified, does the job for the scientific sham:

> If you're anxious for to shine in the scientific line as a man of knowledge rare,

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You must get up all the germs of the scientific terms and plant them everywhere,
You must get behind a podium and prevaricate ad odium about your knowledgeable state of mind,
The meaning doesn't matter if it's only idle chatter of a scientific kind.
And your followers will say,
About your deceptive way,
If that good man expresses himself in terms too deep for me, "Why, what a knowledgeable man that knowledgeable man must be."

Acknowledgements

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Henry M. Morris on Racism

Richard Trott

Institute for Creation Research president Henry M. Morris, among many other creationists, has repeatedly stated that evolutionary theory is often used as a pillar of racism. For example, in *The Troubled Waters of Evolution* Morris (1974:164) writes:

> As the 19th century scientists were converted to evolution, they were also convinced of racism. They were certain that the white race was superior to other races, and the reason for this superiority was to be found in Darwinian theory.

It is instructional to examine the following passage by Morris in his book *The Beginning of the World* (1991:147) in that light.

> The descendants of Ham were marked especially for secular service to mankind. Indeed they were to be "servants of servants," that is "servants *extraordinary!* Although only Canaan is mentioned specifically (possibly because the branch of Ham's family through Canaan would later come into most contact with Israel), the whole family of Ham is in view. The prophecy is worldwide in scope, and, since Shem and Japheth are covered, all Ham's descendants must be also. These include all nations which are neither Semitic nor Japhetic. Thus, all of the Earth's "colored" races—yellow, red, brown, and black—essentially the Afro-Asian group of peoples, including the American Indians—are Hamitic in origin and included within the scope of the Canaanitic prophecy, as well as the Egyptians, Sumerians, Hittitles, and Phoenicians of antiquity.

At this point, Morris discusses the achievements of the people he terms "Hamitic." He then continues (p. 148):

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> Yet the prophecy again has its obverse side. Somehow they have only gone so far and no farther. The Japhethites and Semites have, sooner or later, taken over their territories, and their inventions, and then developed them and utilized them for their own enlargement. Often the Hamites, especially the Negroes, have become actual personal servants or even slaves to the others. Possessed of a genetic character concerned mainly with mundane matters, they have eventually been displaced by the intellectual and philosophical acumen of the Japhethites and the religious zeal of the Semites.

Morris concludes that this is not racist by invoking a strange definition of racism. Somehow, if other human beings are responsible for the plight of a group of people, that is racism; however, if someone (such as Morris) believes that a general line of people (such as the "Hamites") are "possessed of a genetic character" that makes them innately less "intellectual," "philosophical," and "religious" than the rest of humanity, this is not racism. Morris, for additional mitigation, couples this with an allowance for individual exceptions. He writes (p. 148):

> These very general and broad national and racial characteristics obviously admit of many exceptions on an individual genetic basis. It is also obvious that the prophecy is a divine description of future facts, in no way needing the deliberate assistance of man for its accomplishment. Neither Negroes nor any other Hamitic people were intended to be forcibly subjugated on the basis of this Noahic declaration. The prophecy would be inevitably fulfilled because of the innate natures of the three genetic stocks, not by virtue of any artificial constraints imposed by man.

I questioned Henry Morris about this issue personally in North East, Maryland, on July 18, 1993, shortly after he gave an address at a Christian service. Morris claimed that these pronouncements are not racist because there are "Black Jews" and Black "Indians" who are not Hamitic. (Note that this appears to be flatly contradictory to Morris' claim, quoted above, that "all of the Earth's 'colored' races—yellow, red, brown, and black" may be Hamitic.) Furthermore, Morris pointed out that there are whites who have been slaves and are not Hamitic. It is peculiar that any mention of white Hamites is conspicuously absent from Morris' book. Of course, the issue is not whether Morris believes all "swarthy people" are Hamitic, but rather whether he believes that the lineages that are Hamitic are, in general, genetically predisposed to be less "intellectual," philosophical," and "religious" than other lineages. (Incidentally, Morris confirmed to me that he believes African Americans are Hamitic.)

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In our conversation, Morris also made a big deal about individual exceptions to the prophecy. Of course, I am not concerned with whether or not he believes that there are some exceptional individuals within each of the three supposed genetic stocks; I am concerned with whether Morris believes one of the three is, in general, genetically inferior and more "mundane." Arguing there are some some exceptions to the prophecy does not address this issue.

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Were There Birds Before *Archaeopteryx?*

Thomas J. Wheeler

Evolutionists often cite *Archaeopteryx* as one of the best examples of an intermediate or transitional form. Thus, it is important for creationists to discredit the status of *Archaeopteryx* as an intermediate. One approach is to claim that *Archaeopteryx* was a "true bird," and therefore not an intermediate at all. Several books that analyze creationist arguments (for example, McGowan, 1984:110-126) have shown this claim to be invalid. A second approach is to claim that the *Archaeopteryx* fossils are fakes; Fred Hoyle and N.C. Wickramasinghe have proposed that the feather impressions are the work of a forger, and Ian Taylor has further promoted this charge. However, paleontologists working with these specimens have refuted the claim of forgery (Charig et al., 1986; Dickson, 1987). Moreover, the subsequent report of an additional specimen of *Archaeopteryx* with impressions of feather shafts (Wellnhofer, 1988) further argues against this claim. A third approach, which is the subject of this article, is to claim that true birds were living by the time of *Archaeopteryx*, and thus *Archaeopteryx* cannot be an intermediate.

This argument is logically flawed, as pointed out by Strahler (1987:423). Earlier (p. 420), he defined a transitional form as follows:

> A transitional form, then, is judged to be an "intermediate" when its morphological features, or characters, are a combination of two distinct taxa.

According to this definition, an intermediate form need not lie on the direct line of descent connecting two groups. If *Archaeopteryx* had been on a side branch of avian evolution that retained features intermediate between reptiles and more modern birds, it could have existed at the same time as, or even later than, the latter. Alternatively, *Archaeopteryx* could have been on

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the direct line of descent, with some populations persisting relatively unchanged while others evolved to more modern forms.

The argument that true birds preceded *Archaeopteryx* is based on two fossil discoveries. The first, in 1977, was identified as a bird in preliminary news accounts. However, further study showed that it is probably non-avian, and it may not even be older than *Archaeopteryx*. The second discovery, reported in 1986 and given the name *Protoavis*, is currently controversial among paleontologists.

The Jensen Discovery

It was the first of these supposed pre-*Archaeopteryx* birds that prompted my research when I noticed that it was being cited by creationists. Here is how Duane Gish (1985:116) described the discovery:

> A recent discovery by paleontologist James Jensen has dealt an especially serious blow to the claims that *Archaeopteryx* represents a transitional form between reptiles and birds. Jensen has found what he believes to be fossil remains of undoubted modern birds in rocks of the Upper Jurassic, the rocks in which *Archaeopteryx* has been found. Regardless of what one believes about the time scale or the geological column, this discovery, if ultimately verified, means that *Archaeopteryx* was a contemporary of modern birds. John Ostrom, commenting on this turn of events, has been quoted as saying, "It is obvious that we must now look for the ancestors of flying birds in a period of time much older than that in which *Archaeopteryx* lived." Evolutionists have long maintained that contemporaries could not have an ancestor-descendant relationship but if related, they must have evolved from a common ancestor sometime in the past.

The references given by Gish are to preliminary news accounts in *Science News* (112:198 (1977)) and *Science*, rather than regular research articles. The *Science* article (Marx, 1978) described the find by Jensen of an apparent femur of a bird, and reported the preliminary conclusions of John Ostrom ("one of the principal developers of the evidence regarding the evolutionary role of *Archaeopteryx*"):

> Ostrom says that it looks more like a bird bone than anything else. While he has some reservations about the identification, he asserts, "If it's not a bird bone, I don't know what else it is." . . . Although the paleontologist says the identification of the new fossil is about 90 percent certain, he points out that it is not exactly like any of the numerous bones of modern birds with which he has compared it. This is not especially surprising. More disturbing to him is the fact that the

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> fossil is not perfectly preserved and a portion of the head may be missing. In other words, the femur head may be more reptilian in character than it appears.... All in all, Ostrom thinks that it would be premature to knock *Archaeopteryx* off its perch as the oldest form of bird without additional evidence.

The article concluded by noting that

> Jensen thinks that he may have found such confirmatory evidence in the form of another, more complete fossil femur excavated just a few feet away from the one in question. According to the Brigham Young investigator, this second femur is very similar to that of modern birds. Ostrom has not yet examined this latest find, however. Until he does, the situation will remain very much up in the air.

In 1981, Jensen published two accounts of his discoveries, one of them in a Japanese journal (*Anima* 1981:33-39), the other in *Encyclia*, a publication of the Utah Academy of Sciences, Arts, and Letters. The latter (Jensen, 1981) included photographs and drawings of the specimens, as well as a general discussion of bird evolution and the place of *Archaeopteryx*. The key specimen was identified as part of the tibiotarsus of a new genus, *Palaeopteryx*, "representing the most advanced bird known from the Jurassic Period." Two other specimens, a synsacrum and a femur, were identified as "avian-like," while another (half of a femur) was identified as "Archaeopteryx-like."

The facts that paleontologists continued to regard *Archaeopteryx* as the earliest bird-like animal, and that Gish cited preliminary news accounts rather than regular research papers many years after the discovery, suggested that the fossils turned out not to be from birds after all. To see what their status was, I wrote first to Ostrom, then to Jensen. Ostrom (1987) wrote,

> Jim Jensen did find fragments that he thinks are avian, but I am not convinced (I have studied the fragments) and do not agree with him. The quotation attributed to me that Gish repeats again—is NOT a quote from me. It originally was "quoted" in *Science News* and I wrote a letter requesting them to publish my denial, but they did not—and never even acknowledged my letter—or position. . . . Jensen's specimens exist, but it appears that only Jim believes these to be avian, and those ornithologist[s] who have seen the material are *not* about to accept it as "modern" in any sense. I definitely do *not* accept it as certifiable avian.

Jensen (1987) wrote,

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The supposed quotations by me in *Science News* (1977), and *Science* (1978), citing Jensen on *Archaeopteryx* and evolution are both spurious, resulting from *one* telephone interview a woman at *Science* initiated with me, after which she wrote what she *thought* I said, putting words incorrectly into my mouth. I strongly protested to the editors but it did no good. I am still angry about it because these creationist clowns keep flaunting it as "evidence" for their nebulous crusade.

I am not aware of any "ornithologist[s]" having examined the specimen in question, as Ostrom states, and then publishing on it but Dr. Kevin Padian, one of Ostrom's students definitely agreed with me, at one time, that the specimen had close avian affinities. Our later studies led away from that identification and we are now assigning it to the theropods.

We have a paper in review naming a new Upper Jurassic pterosaur genus/species from the Uncompahgre Fauna (Jensen 1987); describing various small specimens; reidentifying any Dry Mesa specimens in question, including the "avian tibiotarsus" (Jensen 1981), to be noted as a deinonychoid distal radius, which should satisfy Ostrom.

Jensen also noted that associates of Gish had talked with him two or three years earlier and were greatly disappointed when he informed them of the misquotation.

Kevin Padian (1988) also wrote to me, saying that the fossil in question

could belong to a bird but is more likely from a small deinonychosaur similar to *Deinonychus* or *Velociraptor*, which as you may know are the closest dinosaurs to the birds. . . . two other small femora in that lot may belong to the same group: again the preserved characters are good enough to place them to this taxonomic level but not good enough to distinguish between deinonychosaur and bird. My own suspicion is that they are not from birds.

He also wrote that the age of the Morrison Formation, which includes the beds containing the fossils, is controversial. These particular beds, which lie near the top of the formation, had recently been dated at 135 million years, making them younger than *Archaeopteryx* (about 150 million years old).

The paper containing the reidentifications described in the letters of Jensen and Padian appeared in 1989 (Jensen and Padian, 1989). Two of the specimens, one previously identified as belonging to the bird *Palaeopteryx* and the other previously described as "Archaeopteryx-like," were assigned to the group Maniraptora (which consists of deinonychosaurs and birds). The two other specimens previously identified as "avian-like" were reidentified

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as pterosaurian, and were tentatively assigned to the new species *Mesadactylus ornithosphyos*.

In their concluding paragraph, the authors wrote:

> With this paper, the authors also hope to put to rest controversies and fallacious statements about the early history of birds that have been generated, mostly in the popular scientific press and in tracts written by fundamentalist religious authors. No material described here is unquestionably avian. Most is pterodactyloid. Several specimens pertain to the monophyletic group formed by birds and deinonychosaurs. *Archaeopteryx* is the earliest known bird; these Morrison sediments are younger than the Solnhofen limestones from which *Archaeopteryx* comes.

Thus, the early reports misquoted both Jensen and Ostrom, and neither they nor Padian now believes that the material discovered by Jensen is avian.

To his credit, Gish (1985) referred to the need to verify the nature of the Jensen discovery. Also, he did not refer to this find in a later article (1989) on *Archaeopteryx*, although it continues to be mentioned in some creationist publications (e.g., Matrisciana and Oakland, 1991:103). However, he apparently did not investigate the status of the fossils in the preparation of his 1985 book (or did not report the results of such an investigation); rather, he used an outdated and inaccurate preliminary account.

Protoavis

A more recent fossil discovery also has been regarded as a challenge to the status of *Archaeopteryx*. In 1986, Sankar Chatterjee revealed the discovery of fossils "claimed to be of two crow-sized birds" in a 225 million-year old formation in Texas, according to a report in *Nature* (Beardsley, 1986). Chatterjee identified several avian features in the fossils, and assigned them to a new genus, *Protoavis*. While he found no feather impressions, he felt there were quill nodes on the bones. Quoting from the *Nature* article,

> *Protoavis* seems certain to reopen a long-running controversy on the evolution of birds, in particular whether the common ancestor of birds and dinosaurs was itself a dinosaur. *Protoavis*, from the later Triassic, appears at the time of the earliest dinosaurs, and if the identification is upheld it seems likely that it will be used to argue against the view of John Ostrom of Yale University that birds are descended from dinosaurs. It also tends to confirm what many paleontologists have long suspected, that *Archaeopteryx* is not on the direct line to modern birds. It is in some ways more reptilian than *Protoavis*, and the period

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> between the late Jurassic *Archaeopteryx* and the worldwide radiation of birds in the Cretaceous has to some seemed suspiciously brief.

The article also noted that Ostrom had examined the finds and expressed reservations:

> Ostrom stresses, however, that the remains are very fragmentary, and while agreeing with Chatterjee's tentative classification says the case is not finally proven.

In contrast to Chatterjee, Ostrom saw no indirect evidence for feathers.

Newspaper and magazine reports describing the Chatterjee discovery sometimes expressed cautious views of paleontologists. However, in general they gave the impression that a revolutionary finding had displaced *Archaeopteryx* from its status as the earliest bird. Before long, creationists (e.g., Gish, 1989) began to cite it as further evidence that *Archaeopteryx* could not be an intermediate.

In their letters to me, Ostrom and Padian commented on this new find. Ostrom (1987) wrote,

> As for Chatterjee's "*Protoavis*," I have seen that material too, and have similar reservations. It *might* be a bird, but it is so poorly preserved and prepared that I would not like to make such a claim. It will always be doubtful as far as I'm concerned, until more and better material is available.

Padian (1988) noted that Chatterjee had been publicizing the discovery for two years, yet had still not submitted his description for a peer-reviewed publication. However, it appears that Chatterjee was forced into public discussion of the material earlier than he might have chosen. As a condition of his research grant from the National Geographic Society, he had to report to them on his work; it was the Society that issued the 1986 press release announcing the discovery (Zimmer, 1992).

Paleontologists had to wait three more years before a research paper describing the work finally appeared (Chatterjee, 1991). Even then, the description was restricted to the cranial anatomy, although photos of the other bones were included. Thus, an additional publication will be needed to complete Chatterjee's analysis. This is important because until he publishes his full analysis, he is not obligated to allow other investigators access to the fossils.

A summary of the history of *Protoavis*, along with the assessments of several paleontologists, was published in *Discover* (Zimmer, 1992). Other commentaries include Ostrom (1991) and Anderson (1991). Paleontologists who are described as being critical of Chatterjee's interpretations include

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Ostrom, Jacques Gauthier, Michael Parrish, Tim Rowe, and Alan Feduccia. Among their reasons for criticism are: 1) The material is very poorly preserved, with some bones being squashed and broken beyond recognition. 2) The material is very incomplete. For example, the bone identified as the furcula (wishbone) is just a fragment, which some critics feel was misidentified. 3) The bones were all removed from the matrix, such that their spatial relationships cannot be determined (although Chatterjee provided sketches of their locations in the matrix). 4) It has been suggested that the bones may actually be from several different animals. 5) Given the poor state of the material, Chatterjee's extrapolations from it to deduce the behavior of *Protoavis* may be unwarranted. 6) Chatterjee's analysis "describes the cranial fragments from an avian perspective only," without consideration of other possibilities (Ostrom, 1991).

Paleontologists who were described in various articles as being more sympathetic to Chatterjee's interpretations include Larry Martin, Walter Bock, Sam Tarsitano, and Nicholas Hotton. In contrast to Chatterjee's critics, Martin and Tarsitano reject the prevailing scenario of dinosaur to bird evolution. They feel that birds more likely evolved from other types of reptiles. If *Protoavis* was a bird, it would support their case, since *Protoavis* appears to have preceded much of the evolution of bird-like dinosaurs. It is interesting that Chatterjee (1991) favors the dinosaur connection, though he acknowledges the problem that small theropod dinosaurs sufficiently old to be ancestral to *Protoavis* are lacking in the fossil record.

Chatterjee (1991) also constructed a phylogenetic tree of Mesozoic birds, based on his own cladistic analysis. According to this tree, *Archaeopteryx* represents the most primitive type of bird, with its ancestors splitting from the avian lineage before *Protoavis*; thus, it would have been a "living fossil" persisting after more modern forms such as *Protoavis* had appeared (and could still be regarded as a transitional form according to the definition given earlier).

The *Discover* article (Zimmer, 1992) also noted that Chatterjee hoped to publish his concluding paper in 1993; it would not only describe the remaining bones, but would also discuss a more recently-discovered fragment of *Protoavis*. Following this publication, other researchers will begin to have access to the bones. Given the skepticism expressed to date, *Protoavis* seems likely to remain controversial for years to come.

Other Early Birds

Before drawing some conclusions from these challenges to the status of *Archaeopteryx*, I would like to note some recent fossil discoveries that clarify bird evolution after *Archaeopteryx*. Until recently, there had been a large gap in the fossil record of birds between the late Jurassic *Archaeopteryx* and various toothed birds of the late Cretaceous (including the hesperornithi-

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forms and *Ichthyornis*). Now, however, three types of early Cretaceous birds are known; these are approximately 120 to 140 million years old. From oldest to youngest, these are: *Sinornis santensis*, from China (Sereno and Rao, 1992); the Las Hoyas bird, from Spain (Sanz et al. 1988); and *Ambiortus dementjevi*, from Mongolia. A cladistic analysis (Sereno and Rao, 1992) indicated that the lineages leading to these three forms diverged in the same order from the line leading to the hesperornithiforms and more modern birds, although this branching order was admittedly tentative.

These three new discoveries can be considered intermediate forms between *Archaeopteryx* and later birds. They shared some primitive features of the former, but were much more adapted to powered flight and perching in trees (Barinaga, 1992).

Another important new discovery, also transitional between *Archaeopteryx* and modern birds, is that of a flightless bird from late Cretaceous deposits in Mongolia (Altangerel et al. 1993a). It was originally given the name *Mononychus*, but since this had been used previously, the substitute *Mononykus* was proposed (Altangerel et al. 1993b). Unlike the specimens discussed above, which are crushed into essentially two-dimensional forms, the two specimens of *Mononykus* were preserved in three dimensions, and thus should yield new information on early bird evolution (Milner 1993).

Meanwhile, there have also been two recent descriptions of fossils that might illuminate the ancestry of *Archaeopteryx*. Milner and Evans (1991) reassessed *Lisboasaurus estesi*, a specimen from Portugal that earlier had been classified as a lizard. They concluded that it was instead closely related to the troodontid dinosaurs. A more tentative conclusion was that it was closely related to *Archaeopteryx* (a news item in *Nature* (353:601) describing the work was entitled "Early Bird"). The specimen is about 160 million years old, which predates *Archaeopteryx*. Elzanowski and Wellnhofer (1992) reported a Mongolian specimen they named *Archaeornithoides deinosauriscus*. This was also identified as a close relative of the troodontids, and it was suggested to be the closest non-avian relative of *Archaeopteryx* and other birds (although it lived much later than *Archaeopteryx*, in the late Cretaceous). It will be interesting to see how other paleontologists will assess these fossils, as well as *Protoavis*, in the years to come.

Conclusions

One general point to be made is that preliminary news accounts can be misleading, and may not accurately represent the views of quoted scientists. The true mark of a scientific discovery is its publication in a peer-reviewed journal. In the case of Jensen and Padian, it appears that careful study during the preparation of such a publication led them to revise their own initial conclusions. In other cases, reviewers of a submitted manuscript may make important suggestions that lead to revisions in the conclusions (in the case of

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poorly performed work, the manuscript may not even be published). One should be suspicious of a discovery, particularly a revolutionary one, which has still not appeared as a paper long after its initial announcement. (In his book *Scientific Creationism*, Morris (1985:162) refers to experiments that allegedly cast doubt on radiocarbon dating. However, the citation is to a 1971 abstract for a presentation at a scientific meeting. The fact that over a decade later Morris was unable to cite a regular paper describing this work suggests that it did not survive rigorous scientific scrutiny.)

A second point is that publication of a study does not guarantee that the findings are correct. While we have no sure way of knowing which are correct and which are not, a useful approach is to see how the work is received by experts in the field (ideally, it would also be reproduced or confirmed by additional discoveries). In the case of *Protoavis*, Chatterjee's assessment of his findings was eventually published, but the work has so far failed to convince some of the leading paleontologists working on bird evolution. Perhaps this negative assessment will change as the specimens are subject to more study, or as other specimens are found and described. However, for the time being Chatterjee's views seem to represent a minority dissent from the prevailing ideas on bird evolution. Creationists often cite such minority views without explaining why they have failed to achieve acceptance.

A third point is that the pattern of evolution is a complex one, with many branchings and dead ends rather than straight lines leading to modern forms. It is very difficult to know if one fossil form was ancestral to another, or just a close relative; indeed, cladistic analyses (e.g., Sereno and Rao, 1992) will generally treat *all* of the fossils under consideration as occupying terminal positions on branches rather than being ancestral to other forms. When only a few fossils related to a given evolutionary transition (such as to humans or to birds) are known, it is easy to envision them as intermediates lying directly on the line of descent. However, as more fossils are discovered, it may not be clear how they were related and which, if any, is ancestral to modern forms. It is ironic that even though our knowledge of evolution is enhanced by such new findings, the problems involved in their interpretation may make it appear to the lay public that we know less than before! Creationists take advantage of this confusion, and cite disagreements among experts as if they were a reason to reject the entire evolutionary scenario.

With respect to *Archaeopteryx*, new discoveries are forcing a reevaluation of *how* birds evolved. However, none of them call into question the conclusion *that* birds evolved from reptiles (most likely dinosaurs). This conclusion is based on various lines of evidence, not just the existence of *Archaeopteryx*. Moreover, even if Chatterjee is correct, and *Archaeopteryx* was a "living fossil" descended from a form that long before had branched off from the line leading to modern birds, it still represents a distinct combination of reptilian and avian features that provides powerful evidence for evolution.

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NOTE: This article was originally based on correspondence carried out in 1986–88 and submitted to *Creation/Evolution* in 1988 and its forthcoming publication was announced in *Creation/Evolution Newsletter* 8(4). I have now updated it to take into account some more recent developments. C/E

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Darwin Prosecuted

Darwin On Trial by Phillip E. Johnson, 1991

Reviewed by Eugenie C. Scott

Phillip Johnson is a professor at the University of California's prestigious Boalt Hall School of Law, and until the publication of *Darwin on Trial* was unknown as an evolution-basher. This book certainly establishes his credentials, however, and we will have Phillip Johnson to kick us around for a long time.

Darwin on Trial is an antievolution book, not a "scientific creationism" book. It complements the anti-evolutionism of the scientific creationists, and provides fuel for those who want to get evolution out of school classrooms. As such, it is important to get the word out as to why the book fails to prove that evolution as a scientific idea is on the skids. Also, Johnson comes from a major university and writes smoothly. As a result, his book has attracted a lot of attention, reportedly selling 40,000 hard-back copies during its first months on the market and now published in a second edition.

Like many conservative Christians, Johnson is concerned with the implications of evolution. Although he states in his book that theistic evolution (evolution that is God-directed) is possible, he doubts it. He is not a young-earth creationist, and in fact, is almost contemptuous of their point of view. He accepts that the earth is old, but rejects evolution, thus he is perhaps describable as an old-earth creationist. His concern with evolution is primarily religious: if evolution by natural selection (Darwinism) really happened, then it is not possible for life to have purpose and for the universe and Earth to have been designed by an omnipotent, personal God. He feels that life would have no meaning, and moral and ethical systems would have no foundation. Thus his goal in *Darwin on Trial* is to demonstrate that Darwinian natural selection is impossible; therefore evolution didn't take place; therefore his theological views are preserved. He stresses that Darwinism is inherently an atheistic, naturalistic philosophy.

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Out of His Element

Let me stress that my objections to *Darwin on Trial* are not because its author lacks a Ph.D. in science. Science is not a secret activity that can be performed or understood only by priests in white coats—I've argued long and hard to try to make science explicable to nonscientists, and to demystify science as a way of knowing. But if one wishes to step out of one's area of expertise, scientist or nonscientist, it behooves one to make a careful study of the new area, and carefully weigh one's pronouncements. If I were to critique the newest developments on astrophysics, or medieval art history, or patent law, I would have to first acquaint myself with not only the fundamentals of physics, art history, or law, but also *astro*physics, *medieval* art history, or *patent* law. Similarly, it behooves Johnson to study not only science, but that particular and complicated science known as evolution.

Johnson has grasped the general picture of evolutionary biology, and even some of the details, but he lacks the deep understanding that is required to make the criticisms he makes. A deep understanding of a field comes from careful study of relevant literature, including primary sources, and communication with specialists in the field. Indeed, Darwinism has been critiqued by evolutionary biologists, but there is a clear difference in quality and nuance between their criticisms and those parroted by Johnson. Perhaps this is because he got most of his information from a suspect source: the criticisms of evolution he offers are immediately recognizable as originating with the "scientific" creationists, (although Johnson disdains young-earth creationism, and speaks disparagingly of Biblical literalism).

We find the usual "gaps in the fossil record," "natural selection is a tautology," "there are no transitional fossils," "mutations are harmful," "natural selection is not creative," "microevolution does not explain macroevolution," "natural selection only produces variation within the kind," and the vertebrate eye and the argument from design, just as in any standard Institute for Creation Research tract. Those of you who are up on creationist literature will be unsurprised to hear that Johnson even tells the tired old Colin Patterson/American Museum of Natural History story, as an example of the "conspiracy" of scientists to "protect" Darwinism from criticism. (See *Reports* 12(4):14-15.)

And this, frankly, is another reason why this book needs to be coped with, and not ignored. In many ways, it is a slick repackaging of scientific creationist materials, though far more sophisticated, and as a result, it holds more potential for harm. It has already been presented to one school board that I know of, as supporting "evidence" for how "arguments against evolution" should be included in the science curriculum. This, of course, is just another variant of the familiar creationist "equal time" argument. Creationist organizations from the Institute for Creation Research, to the Bible-Science Association, to Access Research Network (formerly Students for Origins

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Research) have promoted Johnson's book in various ways. Even though his views differ from theirs in important ways, "an enemy of my enemy is my friend," in the words of the proverb.

In addition to creationist sources, Johnson quotes extensively from the secondary scientific literature, citing works by well-respected authors such as Gould, Futuyma, Dawkins, and others. Now, most he cites are quite competent scientists and historians and even leaders in the field, but the works cited are usually those written for laypersons, such as Gould's *Natural History* columns. A casual reader would necessarily miss a great deal of the detail and nuance of the arguments, though perhaps acquiring an understanding of the broad sweep of contemporary evolutionary science.

As a result of his reliance on creationist sources, Johnson makes a lot of flat-out mistakes. *Archaeopteryx* is not mostly bird; the British Museum did not prevent the inspection of the Piltdown fossils; Zuckerman studied pre-1970 Australopithecines, so his comments on early human evolution are essentially irrelevant; most mutations are not harmful. But mostly the problems in his book reflect subtle misunderstanding of how science works—and knowing or unknowing misstatements of theory in evolutionary biology.

Johnsonian science assumes that something that is not currently fully understood is perhaps un-understandable. He concludes, for example, that the Cambrian fossil explosion, the origin of the first replicating molecule, and the evolution of whales or bats are "difficult problem(s)" for evolution, as if the fact that we don't know all the details of evolution somehow proves evolution didn't take place.

This ignores the consilience factor: the vast amount of detail from natural history that is compatible (only) with the idea that evolution actually took place. If we don't know every link in the fossil phylogeny of bats, why would this make us give up on the idea of evolution, when so many other sources of data support it? We have evidence that evolution occurred from comparative anatomy, geology, biogeography, biochemistry, astronomy—all shouting that change has taken place during the history of the universe. We can predict from comparative anatomy the fossil sequence tetrapod-reptile-mammal before we even look at the rocks. This entire monument is not about to be disassembled because we don't know exactly how bats evolved from primitive insectivores. Consilience is a phenomenon that creationists seem to have great difficulty with, so they ignore it. So does Johnson.

For someone who writes so extensively about fossils, he has remarkably little understanding of what paleontologists do, as shown by his treatment of the legged and footed fossil whale, *Basilosaurus*. In his notes at the end of the book (which provide illuminating glimpses into his mind-set) he states his skepticism that the legs and feet really belong to the specimen: "The article states that 'Limb and foot bones described here were all found in direct association with articulated skeletons of *Basilosaurus isis* and undoubtedly represent this species.' Although I accept the authors' description for pur-

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poses of this chapter, I confess that expressions like 'found in direct association with' and 'undoubtedly' whet my curiosity. Is it certain that *Basilosaurus* had shrunken hind limbs, or is it only certain that fossil foot bones were found reasonably close to *Basilosaurus* skeletons?" Amazing! "Found in direct association" is a term of art in archaeology and paleontology referring not only to proximity but to context (position, geological features, evidence of disturbance or intrusion, etc.) The phrase doesn't mean, "we think in an offhand manner that maybe these bones go together," but Johnson seems unaware of this. How can someone criticize the fossil record and have so little understanding of what paleontologists do? In addition, to criticize an interpretation of a specific fossil, one should know the comparative anatomy involved. The discoverers of *Basilosaurus* fortunately are skilled anatomists able to tell whether a set of fossil leg and foot bones did or did not articulate with the body as a whole.

Perhaps his greatest misunderstanding of evolution is his expectation of what a "transitional form" should be like. His goal, of course, is to discredit his version of Darwinism, which stresses slow, gradual evolution. (Johnson sometimes means Darwinism, and sometimes means Neo-Darwinism, but that is another issue.) Like the ICR's Duane Gish, Johnson will not accept evolution unless a lineage can be recreated showing every individual specimen from A to Z. If mammals arose from reptiles, for example (which technically, they didn't, but from a tetrapod common ancestor), then to "prove" this, evolutionists would have to show them a fossil that is 25% mammal and 75% reptile, then one that is 50:50, and one that is 25% reptile and 75% reptile—and then kindly fill in the gaps, please. What great confidence this shows in the fossil record! Futuyma (1982:191) puts it best, "The creationist argument that if evolution were true we should have an abundance of intermediate fossils is built by exaggerating the richness of paleontological collections, by denying the transitional series that exist, and by distorting, or misunderstanding, the genetical theory of evolution."

The way Darwin expected the fossil record to look is irrelevant to modern evolutionary theory; Darwin died 112 years ago. We can reasonably expect theory to change in a century. To quote Futuyma (p. 191) again, "The supposition that evolution proceeds very slowly and gradually, and so should leave thousands of fossil intermediates of any species in its wake, has not been part of evolutionary theory for more than thirty years." But Johnson flogs the gradualist horse because it serves his purpose to discredit evolution.

Modern evolutionists, on the other hand, are more concerned with tracing the *pattern* of evolution, rather than tracing a specific lineage down to the gnat's eyelash. The pattern of evolution is more likely to be shown across a broad series of lineages within an evolving taxon. Transitional structures are sought, rather than individual specimens showing precise intermediacy in all anatomical structures. Evolutionists consider a transitional structure to be one that shows characteristics of more than one taxon. Thus a number of

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fossils sometimes called reptile-like mammals show characteristics of mammals and also of more primitive tetrapods. These characteristics are especially clear in the skull, and particularly the lower jaw.

It would take a very long essay to criticize all or even most of the misleading, or just plain wrong, statements Johnson makes about evolutionary biology. For example, "Darwinists do not in principle deny the fundamental discontinuity of the living world, but they explain it as being due to the extinction of vast numbers of intermediates that once linked the discrete groups to their remote common ancestors" (p. 87). Wrong. First of all, the discontinuity of modern groups is not something embarrassing to "Darwinists" which they are trying to deny. Discontinuity exists, and it exists because of the process of speciation, which produces reproductively isolated groups of organisms through a number of well-understood processes of heredity. The hierarchy of taxa produced by evolution would be discrete regardless of whether we had examples of every intermediate species. It is just how we expect evolution to work, but Johnson does not understand this. As one reads the book, one stops over and over to say, "No, that's not quite right." It is as if Johnson is talking about a familiar topic, but he gives it a spin that requires careful reading—sort of like discussing a zebra as a horse-like quadraped distinguished by a stiff mane and black and red stripes.

Johnson demonstrates another problem that I have not seen discussed in many other reviews (see Hull, 1991, Hurwitt, 1991, Jukes, 1991, Quinn, 1991, Gray, 1992). He clearly does not understand the meanings scientists give to many of their terms. He deliberately conflates pairs of ideas that properly are separate. I have selected a few of these for discussion.

Evolution is Not Evolution*ism*

First, Johnson defines evolution as if it were an ideology: evolution*ism*. Evolutionism to him is a philosophy that excludes the possibility of divine intervention occurring during evolution. Some individuals *have* made an ideology out of evolution, but Johnson errs in assuming that therefore evolution itself is an incorrect explanation of the history of the universe.

The quality or usefulness of a scientific idea is independent of the philosophical implications one may or may not draw from it. The fact that one can take a scientific idea and make an ideology out of it does not mean that every treatment of this idea will require an ideological treatment. If a high school teacher someplace should decide that photosynthesis is the foundation for a new religion, that doesn't mean that other teachers should cease teaching photosynthesis. Yet Johnson worries greatly that children will learn evolution*ism* rather than "just" evolution, and then lose their faith in there being a purpose for life. In this regard, let me reassure Johnson that in speaking with hundreds of teachers all over the country, I have found that when evolution is taught, evolution is taught, not evolution*ism*. Most teachers

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appear to be strongly (and conventionally) religious. I know of no recent national survey, but a recent survey of Texas teachers shows a high degree of church attendance (80%) (Markley, 1991).

Science is not Philosophical Naturalism

Johnson protests that Darwinism cannot be extricated from atheistic, materialist philosophy. Evolution is defined in *Darwin on Trial* as "fully naturalistic evolution, —meaning evolution that is not directed by any purposeful intelligence" (p. 4). In this he errs, as do many "scientific" creationists, in conflating the necessary methodological materialism of science with philosophical materialism or naturalism. Naturalism is a philosophy stating that God does not have anything to do with the universe, about which science, as a non-theistic (rather than anti-theistic) enterprise, can say nothing. Like the more familiar ICR creationists, Johnson doesn't want to allow science to be a purely naturalistic, materialist exercise; he insists on the right to retain the possibility of divine intervention or guidance.

Unfortunately, for him, that is just not the way science operates in the late 20th century, and for good reason. Naturalistic explanations have been found to be far more fruitful in the explanation of natural phenomena than supernatural ones. The problem with supernatural explanations is that, correct or incorrect, they cannot be rejected, and science proceeds by rejecting explanations rather than "proving" them true. If you want to know whether the earth goes around the sun or the sun goes around the earth, you'll get a lot farther if you posit testable, natural explanations rather than untestable ones from supernatural revelation. The Hare Krishnas, based on their understanding of the Vedas, believe that the sun is closer to the earth than is the moon. Do you want revelation or empiricism to determine where to send the Apollo mission?

Evolution Is Not the Same As Darwinism

Johnson conflates evolution and Darwinism, believing that by disproving Darwinism, he can demonstrate evolution could not have occurred.

Evolution is a statement about the history of the universe: that the universe has a past. The message of evolution essentially is that change has occurred, as opposed to special creation's view that all the galaxies, solar systems, planets, and organisms in the universe were specially created all at one time. The difference between an evolutionist and a creationist is not "Did God create?" but "What is the history of the universe?" Did everything we see today occur all at one time, or is the universe of today different than it was in the past? Also, evolution refers to a very broad spectrum of natural phenomena: from galaxies and stars and solar systems, to geological phenomena, to organic life.

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Darwinism is a mechanism by which part of this spectrum of history may be explained, in whole or in part. Darwinism attempts to explain organic evolution, at least in major part, by natural selection. But Darwinism is only one possible explanation for the history of life. If Darwinism were to be discovered not to explain organic evolution, this would have nothing in the universe (literally) to do with whether stellar or galactic evolution took place—or even whether organic evolution took place. Johnson does not recognize that by trying to disprove organic evolution by natural selection, he leaves untouched the explanation of organic evolution by other mechanisms. But he really doesn't care. His main concern is whether *human* evolution, one small component of this great sweeping theory, is adequately explained by natural causes, or requires supernatural purpose and design.

The Origin of Life is Not the Same as Evolution
The Big Bang Is Not the Same as Evolution

Like the scientific creationists, Johnson confuses the origin of life and the Big Bang (the origin of the universe) with evolution. This is rather like confusing starting up the car's engine with driving away. It is necessary to start the engine to go anywhere, but there is nothing inherent about starting the car that tells you whether you are going to work, or to the corner store, or just idling in the driveway. The origin of life and the Big Bang are both interesting scientific problems, and, as they do with any scientific problem, scientists are attempting to explain them with natural rather than supernatural explanations. Clearly, there is much more to be learned about both, but it appears as if it is *possible* to explain these phenomena naturally. This possibility is offensive to creationists, who demand that supernatural forces must be invoked. Still, logically, whether the origin of the universe and the production of the first replicating molecule are ever fully explained with naturalistic explanations has nothing to do with what happened subsequently. Did evolution take place, or not?

Just as the ICR's Duane Gish in his debates shifts smoothly to the origin of life when his debate opponents are sufficiently knowledgeable to defend the fossil record, so Johnson apparently thinks the incompleteness of explanations for the origin of life/Big Bang appear to the general public as soft underbellies of evolution.

Materialism, Religion, and Darwinism

Johnson presents a narrow view of science, an inaccurate view of evolution/Darwinism, and even a narrow theology. In a 1992 speech Johnson remarked:

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> Our discussion today is over whether belief in Darwinism is compatible with a meaningful theism. When most people ask that question, they take the Darwinism for granted and ask whether the theism has to be discarded. I think it is more illuminating to approach the question from the other side. Is there any reason that a person who believes in a real, personal God should believe Darwinist claims that biological creation occurred through a fully naturalistic evolutionary process? The answer is clearly "no" (Johnson, 1992, p. 4).

Applying the lawyer's "cold, dispassionate eye for logic and proof" as touted on his book's dustjacket, Johnson manages to set up another strawman that does not accurately reflect the real relationship between evolution and religion. Evolution is presented as a "fully naturalistic process," implying an antithesis between evolution and the supernatural. This certainly is not the position of the majority of Christians in the US today, neither Catholic nor main-line Protestants.

Johnson confuses the necessary *methodological* materialism (or naturalism) of science with philosophical materialism/naturalism. Science neither denies nor opposes the supernatural, but *ignores* the supernatural for methodological reasons. The history of science has shown that progress comes from logical and empirical study rather than reference to revelation or to inner psychological states. That's how we play our game; his basketball won't work on our baseball field. The essence of science is empiricism and control of variables, and if there is an omnipotent God, it certainly can't be controlled like temperature or humidity. Science has made a little deal with itself: because you can't put God in a test tube (or keep it out of one), science acts as if the supernatural did not exist. This methodological materialism is the cornerstone of modern science.

Materialism also is the cornerstone of mathematics. It may be the case that God caused 2+2 to equal 4, but ultimate cause is irrelevant to the mathematical applications that can be made to 2+2 = 4. Scientists no more accept supernatural explanations for phenomena than mathematicians would accept a solution to a mathematical problem based on revelation. Yet no one claims mathematics is antireligious. Neither is science.

Johnson fails to recognize the necessity for methodological materialism, because of his concern for philosophical materialism's attack on his theology. The *process* of evolutionary change, like any scientific process, *must* be studied without reference to the supernatural. Johnson is certainly welcome to criticize *philosophical* materialism if he wishes to, but such a criticism is irrelevant to science.

This conflation of methodological materialism with philosophical materialism also confuses two very different types of causation: proximate and ultimate. Science deals only with proximate cause; religion deals with ultimate cause. If God produced the Big Bang, or the first replicating

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molecule, science can tell us nothing about this, because *the supernatural is outside of the realm of things that science can explain*. Statements of ultimate cause may be true or false or in between, but they are not testable through the method of scientific discovery. They must be tested using other canons of thought, if they are testable at all. Johnson states that it is *possible* that God created through evolution, an alternative to a "fully naturalistic evolutionary process," but he doubts it.

This, however, is the position embraced by the majority of main-line Protestant and Catholic theologians: theistic evolution. I define theistic evolution as evolution governed by natural processes but begun by and/or guided by God. (There are many varieties of theistic evolution, as there are many nuances of the understanding of God in Christianity.) We can understand the natural processes using the methods of science, but we cannot understand the ultimate cause.

Johnson wants to prove that Darwinism is not science but an outgrowth of materialist philosophy. He does not recognize theistic evolution as a common compromise between the facts of science and the desire to retain a religious perspective. Darwinism (evolution by natural selection) can be taught (and in my experience, is taught most of the time) without expressly presenting its implications for conservative Christian theology. But it cannot be denied that Darwinism has implications for conservative Christian theology of the kind espoused by the scientific creationists, and even the kind held (I assume) by Johnson. To explain this, let me review a little history.

If nothing else evolves on this planet, religion does. The medieval Christian God was an anthropomorphic character (remember Michelangelo's *The Creation*), male, old, wise, sitting on a throne, dispensing justice and watching every sparrow that falls. He had human attributes: he "walked" in the Garden with Adam and Eve, he "rested" on the seventh day, he had (especially in the Old Testament) human emotions of anger, revenge, and wrath, as well as love. This traditional God created a universe for humankind, and our "kind" was at the pinnacle of creation.

Then came Galileo and heliocentrism. It has taken us 300 years, but finally we have gotten the idea that far from the world being created central to the universe, it is actually a rather minor (if special and oh-so-lovely) planet whirling in a predictable and knowable orbit around an undistinguished star off in the boondocks of an arm of one galaxy among millions. Few (except for the geocentric wing of the "scientific" creationists—and believe it or not, there is one) feel great upheavals in their theology because of the triumph of heliocentrism (and sphericity) over geocentric and flat-earth Biblical literalism.

But it will take us longer to get over Darwin. It was bad enough to have to learn that the universe wasn't prepared specially for *Homo sapiens*, but then to find out that our "kind" did not stand on the top of the Great Chain of Being, but was produced by the same general processes that produced

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cockroaches and gerbils, and that, further, we are genealogically linked to cockroaches and gerbils and every other creature on earth, was more than the medieval version of Christianity still practiced in the 19th century could bear. Evolution occurred. Partly (but not exclusively) as a result of Darwinism, Catholics and most Protestant sects began thinking of God as a more abstract entity: perhaps more distant but ultimately more powerful and awe-inspiring. Deism, the idea of God as ultimate creator through laws—a Divine Watchmaker who winds up the universal clock and then lets it tick on according to established regularities ("laws"), was strengthened during the 19th century and is today a prominent component of main-line Christian religion. But not of fundamentalist, Biblical literalist religion. This theology seeks a personal, involved God with a special (if unknown) plan and purpose for mankind.

Johnson is correct when he says that Darwinism has implications for religion, especially fundamentalist religion, but so does natural history in general. Observations by naturalists, evolutionarily-inclined or not, show nature as a not very peaceable kingdom. Some really yucky things go on out there, and it is difficult to imagine them being the direct product of a beneficent creator God who prizes humankind above all else in creation. There is evil as well as good on this earth, and suffering and pain afflict both the deserving and the innocent, and there is a lot of suffering and pain—more than would seem to be reasonable if man were just being punished for the Fall. And if man is being punished for the sins of Adam, why does animal life have to suffer so much? A rather unpleasant-looking videotape being advertised currently appears to be a sequence of scenes wherein animals claw, bite, crush, slash, and tear one another apart, for food, defense, sexual competition—or fun. A killer whale seizes a seal in its mouth and smashes it against the beach; a male lion rushes into a group of cubs sired by another and rips them apart; hyenas tear the throat out of a zebra colt. Just another day on planet earth. The more we learn about the natural world, the more it appears to be a not very humanely-designed place—with or without the insights of natural selection theory.

Meanwhile, philosophers and theologians have long debated the evil and suffering experienced by our own species. It didn't start new with Darwin. Why are some children born with congenital diseases who will live only a few painful years, and then die horribly, and others children suffer from a lack of food, or shelter, or abuse by parents? Poverty-stricken people seem to go from famine to hurricane to earthquake—how can this be "planned" or "designed?" (Here again, science gives only the proximate answers to these questions: the strips of DNA that go awry and produce the Tay-Sachs baby, or the atmospheric pressure systems that produce the hurricane, or the social and political currents that produce civil wars, famines and other human disasters. It can't give us the ultimate answers.) Theologians have long debated whether our sometimes nasty and brutal world is the product of special consideration of a benign deity—a topic is beyond this review.

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As Rachels (1990) points out, the reason Darwin caused such a theological stir was that he replaced teleology, or purpose, in science with natural causes. *And this is what Johnson finds so offensive about Darwinism.* This is not the time nor the place to go into a discourse on teleology in biology, nor the reasons why scientists no longer accept teleological explanations (see Dawkins, 1986). The argument from design is dead in science, and if Darwin hadn't killed it, it would have died off from some other cause.

But why does the death of teleology in science necessarily mean the death of teleology in religion? An individual can recognize that the natural world operates according to natural laws that we can discover, and still maintain a belief in purpose for life. Certainly many theistic evolutionists do just this. Humanists, who reject the supernatural, see purposes for their individual lives and for life in general. But Johnson is correct that most forms of theistic evolution surmise a less-engaged God than that of his own theology.

Summary

Darwin on Trial attacks evolution by natural selection in an attempt to bolster a theology based on a personal God who created humankind for a reason, and gave us a purpose. It does this by trying to convince the reader that evolution did not occur, and that Darwinism, as a mechanism, is inadequate to explain how descent with modification could have occurred. The arguments are recycled arguments from the discredited "scientific" creationists, although they are presented with style and persuasiveness.

The book fails to disprove evolution, but the spirit behind it deserves to be recognized by all scientists. Johnson reflects the anguish expressed by many conservative Christians who believe that something terribly important is lost if evolution is true, and especially if the way things changed is through the wasteful and unattractive mechanism of natural selection. To someone who is serious about religion, Darwinian evolution needs to be coped with, and it may not be psychologically easy. Unfortunately, the job of a science teacher is to teach state of the art science, and that means evolution. Students who do not understand evolution cannot be said to be scientifically literate. Each student brings a somewhat different background of experiences and attitudes to any class, and only the student can resolve conflicts between what is brought to the class and what is taught in it. But it is also imperative that the teacher not make this job more difficult by gratuitously inserting his or her own philosophy into the course. It is not essential to the teaching of evolution to teach evolution*ism* as a materialist philosophy, but this is a major concern of conservative Christians—and Phillip Johnson.

There certainly are scientists such as William Provine and G.G. Simpson, whose statements encourage Johnson's view that Christian children are being taught evolution*ism* rather than "just science." But there are no good data showing the frequency with which a college or high school teacher accom-

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panies the teaching of "evolution occurred, and here's how it happened" with "therefore you must give up your belief in God." My personal experience is that this is exceedingly rare; Johnson worries that it *predominates*.

Many religious individuals, including scientists, accommodate their theology to evolution. Johnson, on the other hand, prefers to accommodate science to his theology. Regardless of one's views on materialism as a philosophy, in science, it is a *methodological* necessity. *Darwin on Trial* deserves to be read by scientists, not for its scientific value, which is negligible, but for its potential social and political impact.

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Reply to Landau and Landau

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In "Random Protein Formations and the Origin of Life" (Landau and Landau, *C/E* Winter 1991-1992), the authors purport to challenge ". . . one of the stronger creationist arguments." This is the mathematical basis supporting the conclusion ". . . .that life could not have originated by random processes."

As an evolutionist I examined this problem for *many* years, only to find myself intellectually compelled to acknowledge (albeit reluctantly) the legitimacy of the creationists' position on this important issue. This Landau and Landau 'challenge,' being based solely upon non-applicable, author-selected relationships, is as disappointing as it is deceptive. It does not address *any* of the well-defined probability factors actually cited by creationists in developing their "stronger" arguments, as required by good science.

Rather, the statement of the improbability of a random origin of life presented for challenge, "20^{100}, or 1.27×10^{130}, essentially an impossibility (Gish 1972)," is a totally out of context misrepresentation. It is *not* found in the Gish reference cited, as implied. And it is not a reasonable creationist (or evolutionist) approximation of the stated random formation of a "typical small protein" from a real-world, nutrient-rich 'soup.' These figures are merely an expression of the number of different ways 20 units (aminos) might link into a protein chain 100 units long. Though seemingly large, this strawman figure is (embarrassingly) *hundreds of orders of magnitude smaller* than those appearing in actual creationists' arguments.

Any legitimate challenge to the mathematical improbability of the spontaneous formation of a typical 'average' biologically useful protein (much less, the "origin of life" noted in the title) must at least address the following:

> The number of amino-like compounds formed and co-existing in nature greatly exceeds the 20 unique forms found in all life. Inclusion

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Ed.: These replies are being published one to two years delayed because of editorial and space available glitches, not because their authors were slow to respond.

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of any one of these other equally chemically active forms is typically lethal. As such, say "50" (or more) must be substituted for the unnatural "20" considered by the Landaus, and the new figure becomes 50^{100}.

The average protein in simplest life is closer to 400 links than 100 ("typical small protein") selected by the authors. To reflect this real world consideration, the figure must again be dramatically increased—now to 50^{400}. And this represents only ONE of the 200 to 600 different proteins that must be simultaneously present (and properly sequenced) for a simplest 'living' cell. This problem is further compounded in that the energy/forces required to build proteins are even more efficient in destroying them. Factored in, these phenomena produce improbabilities upwards of 10^{-57800}. (See *Evolution: Possible or Impossible*, by James F. Coppedge, Zondervan Books, 1973, p. 167.)

The artificial basis for, and the failure of the Landaus to address any of the actual, clearly stated creationist positions appears unappreciated by your readers. Indeed, it has already been twice cited to me (once by a teaching science Ph.D. who should know better) as refuting this long-troublesome but still scientifically unchallenged argument. NCSE publications are known to quickly correct/denounce errors and/or exaggeration in creationist publications and should do so in the case of evolutionary writings in its journal, as well.

Ed: This issue will be addressed further in the future. One correction to the above: The creationist argument re: chance and odds has definitely been "scientifically challenged," whether or not one accepts the results. A glance at the C/E Index shows about three column inches of references in C/E alone.

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Comment on Zimmerman and Defining "Evolution"

Ronald H. Pine
Illinois Mathematics and Science Academy
Aurora, IL

Zimmerman (*C/E* 29) found that only 4.6% of responding U.S. Congressmen and 0% of responding Ohio House and Senate members recognized the statement "Evolution occurred because different individuals left different numbers of offspring" as the best of five provided "definitions . . . of the modern theory of evolution." I find this definition (synopsis?) sufficiently devoid of meaningful content that supposed ignorance of it on the part of respondents doesn't necessarily explain why it was not chosen. Everyone for thousands of years has known that different individuals "left" different numbers of offspring (I have two children, my brother has one, for example), but if knowledge of this most elementary fact should somehow take one a considerable way down the road to our modern understanding of evolution, then it seems odd that we did not get any farther than we did in our acceptance and understanding of the process long before the 19th century. Missing from the statement is any hint of "long-term-lineage-thinking," variation, or heredity. Exactly *what happens* to the offspring that are "left" is what is crucial, not just their numbers. If this were not so, we should expect to find evidence of relentless long-term increases in the numbers of offspring produced in every evolutionary line on Earth. The important point os that (inheritable) *properties of the organisms in question* influence long-term *multigenerational* success in leaving relatively large numbers of descendants. Although I have railed for years against use of the misleading phrase "survival of the fittest" (one of Zimmerman's less-favored alternative choices), it at least expresses the essential point that it is the particular characteristics possessed by organisms that are crucial in long-term evolutionary "success"—and if I had been sent the questionnaire I would have (most reluctantly) had to choose that statement as the best answer available on his list of options.

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Correspondence

• *As the instructor of mystery fiction appreciation course for our local community college I read the article "Science at Bob Thurston University" by Kathryn Lasky Knight (Issue 30, 1992)) with great interest. Today's mystery readers are a demanding lot, not only demanding interesting "mysteries" but also good characterizations, authentic locales, and valuing the presentations of different sides of moral dilemmas, as well as logical solutions. Readers want to know not only who committed the crime, but why—and within a logical format.*

It seems to me that there is a great mystery book out there that will set creationists based on dogma and faith against evolutionists with arguments based on concrete scientific evidence.

I never expected to see reference to mystery fiction in C/E; what a nice surprise.

Roberta Ann Henrich
Victoria, B.C., Canada

CORRECTION: A reference was omitted from Karl Fezer's "Creationism: Please Don't Call It Science," in *C/E* 32:

Gish, Duane T. 1985. *Evolution: The Challenge of the Fossil Record.* El Cajon, CA: Creation-Life Publishers.

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